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Applications for Waiver of Effective Date of the 1981 Model Year Carbon Monoxide Emission Standard for Light-Duty Motor Vehicles—Fifth Consolidated Decision of the Administrator

ENVIRONMENTAL PROTECTION AGENCY

[FRL 1498-5]

Applications for Waiver of Effective Date of the 1981 Model Year Carbon Monoxide Emission Standard for Light-Duty Motor Vehicles—Fifth Consolidated Decision of the Administrator

I. Introduction

This is the fifth consolidated decision I have issued under Section 202(b)(5) of the Clean Air Act, as amended (Act), 42 U.S.C. 7521(b)(5), regarding applications from automobile manufacturers for waiver of the 3.4 grams per vehicle mile (gpm) carbon monoxide (CO) emission standard scheduled to apply to 1981 and 1982 model year light-duty motor vehicles and engines.[1]

As the introductions to the previous consolidated decisions explain, section 202(b)(1)(A) of the amended Act establishes a schedule for implementing standards applicable to CO emissions for 1977 and later model year light-duty motor vehicles and engines.[2] The 1977 amendments to the Act, however, included a new provision allowing the Administrator of the Environmental Protection Agency (EPA), under certain limited conditions, to delay for up to two model years implementation of the statutory 3.4 gpm CO standard scheduled to take effect for the 1981 model year.[3] However, these amendments require the Administrator to promulgate standards for vehicles granted waiver applications which do not permit CO emissions over 7.0 gpm.[4]

In response to waiver applications, EPA already has held three sets of public hearings and issued four consolidated decisions pursuant to section 202(b)(5)(A).[5] In those decisions, I denied waivers for certain engine families either because I determined that effective control technology [6] was available contrary to the requirement of section 202(b)(5)(C)(iii) of the Act or because the applicant failed to provide sufficient information to establish that effective control technology was not available. Furthermore, the applicants failed to establish that considerations of costs, driveability, or fuel economy gave me a basis for reaching a different conclusion. I granted the waiver applications covering the remaining engine families after determining for each of those families that the requisite technology was not available and that the application met each of the statutory criteria for receiving a waiver.

From January 8 through February 8, 1980, EPA received waiver applications from Renault, Peugeot, Ford and GM.[7] Specifically, Peugeot and Ford submitted new applications, while GM and Renault requested waivers for engine families denied waivers in the first (GM) [8] and second (Renault) [9] consolidated decisions. EPA held hearings on these applications on February 12, 1980.[10]

This decision will address only the waiver requests from Renault and Peugeot on the basis of previously offered and recently provided information from these manufacturers and from other sources.[11] I will address the waiver requests by Ford and GM in a separate decision which I will issue shortly.

II. Summary of Decision

I am denying waiver requests covering the following engine families for the model years specified:

Waiver Applications Denied

Manufacturer	Model year denied	Engine family
Renault	1981, 1982	85 CID
Peugeot	1981, 1982	174 CID

Neither Renault nor Peugeot established that effective control technology is not available to enable these engine families to meet the statutory CO standard by the 1981 model year. Instead, the information in the record at this time indicates that such technology is available for Renault's 85 CID engine family. Peugeot has failed to provide information sufficient to establish that effective control technology is not available for its 174 CID engine family for the model years in question. Considerations of costs, driveability, or fuel economy, whether viewed separately or cumulatively, do not give me a basis for altering my determinations regarding the availability of technology for these engine families.

While these engine families may meet some, or all, of the remaining statutory criteria for receiving waivers, my determinations regarding available technology, considering costs, driveability, and fuel economy, preclude me from granting waivers covering these two engine families.

III. Discussion

A. Availability of Technology

The decisions I have made here on whether to grant or deny the requested

[1] The preceding decisions were published as follows: 44 FR 53376 (September 13, 1979); 44 FR 69417 (December 3, 1979); 45 FR 7122 (January 31, 1980); 45 FR 17914 (March 19, 1980).

[2] Regulations were promulgated on August 15, 1979, setting a CO standard of 3.4 gpm for 1981 and later model year vehicles. 40 CFR 86.081-8(a)(1)(ii), 43 FR 37972. This standard requires at least a 90 percent reduction in CO emissions from the CO standard applicable to 1970 model year vehicles.

[3] Section 202(b)(5)(C) of the Act provides, in part: The Administrator may grant such waiver if he finds that protection of the public health does not require attainment of such 90 percent reduction for carbon monoxide for the model years to which such waiver applies in the case of such vehicles and engines and if he determines that—

(i) such waiver is essential to the public interest or the public health and welfare of the United States;

(ii) all good faith efforts have been made to meet the standards established by this subsection;

(iii) the applicant has established that effective control technology, processes, operating methods, or other alternatives are not available or have not been available with respect to the model in question for a sufficient period of time to achieve compliance prior to the effective date of such standards, taking into consideration costs, driveability, and fuel economy; and

(iv) studies and investigations of the National Academy of Sciences conducted pursuant to subsection (c) and other information available to him has not indicated that technology, processes, or other alterntives are available (within the meaning of clause (iii) to meet such standards.

[4] As noted in previous decisions, Section 202(b)(5) of the Act requires that I make a separate assessment for each vehicle model covered by a waiver request. 44 FR 53376 (September 13, 1979), 44 FR 69416 (December 3, 1979), 45 FR 7122 (January 31, 1980). Thus, these earlier consolidated decisions have included separate decisions for individual engine families. As in the previous decisions, I have distinguished among engine families primarily on the basis of engine displacement. See footnote 17, second consolidated decision, 44 FR 69416, 69418 (December 3, 1979).

[5] I announced the fourth decision, in response to a consolidated waiver application by Chrysler, separately from the decision on applications by other manufacturers considered at the third hearing. EPA has included in the record for this decision testimony received at these three hearings, as well as all other information considered in deciding these three groups of waiver applications, in EPA Public Dockets EN-79-4, EN-79-17, and EN-79-19, respectively.

[6] As was the case in the earlier consolidated decisions, I am using the term "technology" in this decision to encompass the statutory language "technology, processes, operating methods, or other alternatives" included as part of section 202(b)(5)(C)(iii) of the Act.

[7] Respectively, Regie Nationale Des Usines Renault; Automobiles Peugeot; Ford Motor Company and General Motors Corporation.

[8] 44 FR 53376 (September 13, 1979).

[9] 44 FR 69416, 69419, (December 3, 1979).

[10] The transcript from this hearing is located in EPA Public Docket EN-80-1. This decision uses the following abbreviations:

R. Reapp.—Renault Petition for Reconsideration, dated January 8, 1980.

P. App.—Peugeot Application for Waiver, dated January 14, 1980.

[11] See the discussion on my consideration of other sources of information in the previous waiver decisions, e.g. section III(B)(1)(C), 44 FR 69416, 69422 (Dec. 3, 1979).

waivers again turn primarily on whether technology is available to enable an engine family covered by one of these waiver applications to meet the 3.4 gpm CO standard in the 1981 model year. Section 202(b)(5)(C)(iii) of the Act expressly assigns an applicant the task of establishing that effective CO control technology is not available, taking into consideration costs, driveability, and fuel economy. Even if the Administrator determines that an applicant has met this burden, section 202(b)(5)(C)(iv) requires the Administrator to consider whether NAS studies or other information indicate that technology is available, considering costs, driveability, and fuel economy, before granting a waiver request.

As was the case in the previous consolidated CO waiver decisions, this consolidated decision relies on information contained in the waiver applications and other information found in the public record.[12]

To support contentions that effective control technology is not available, the waiver applicants have provided both descriptions of the systems they have been considering in trying to attain the 3.4 gpm CO emission standard and emission test results they have measured from vehicles incorporating those systems. I also have reviewed data from emission tests performed on vehicles for the purpose of receiving certification for the 1980 and 1981 model years. This additional information, as well as other information available to me, fails to establish that the requisite technology, considering costs, driveability, and fuel economy, is not available for the engine families in question.

As part of my assessment of technology, section 202(b)(5)(C)(iv) of the Act requires that I consider the results of NAS studies and investigations [13] conducted under section 202(c) of the Act regarding available technolgoy, processes, or other alternatives. For the reasons discussed in my earlier consolidated waiver decisions, the findings of the available NAS studies do not contradict my assessment regarding the availability of technology for these two engine families.[14]

1. Renault

Renault requested reconsideration of the December 3, 1979, decision denying its application for a CO waiver for the 85 CID engine family for the 1981 and 1982 model years.[15] I denied Renault's previous waiver request because I concluded that Renault failed to establish that effective emission control technology is not available. My decision was based on the technical analysis which indicated that this engine family as described by Renault could meet the 3.4 CO standard with the addition of a clean-up oxidation catalyst with a switched-air system. I also determined that Renault had failed to establish that space constraints would preclude the addition of those components on its vehicles.

On January 10, 1980, Renault reapplied for a waiver of the 3.4 gpm CO standard for the 85 CID engine family for the 1981 and 1982 model years. As part of its current application, Renault submitted additional emission test data and further technical information. Renault reasserted that this information establishes that it is unable physically to incorporate the clean-up oxidation catalyst with switched-air system in an optimized location in vehicles employing its 85 CID engine family due to space restrictions and lead time requirements.[16]

Renault further contended that in my previous decision I overestimated the emission improvement factor developed in that decision to predict the emissions improvements which addition of these components would achieve. Renault thus claims that this information ultimately establishes the unavailability of effective control technology to enable this engine family to meet the 3.4 gpm CO standard.[17] In addition, Renault expressed concern over whether its current 1981 system, without the additional components, could meet its own design goals for emissions in order to ensure successful Selective Enforcement Audit (SEA) testing at the 40% Acceptable Quality Level (AQL).[18]

I have determined that Renault has failed to establish that effective emission control technology, considering costs, driveability, and fuel economy, is not available to enable its 85 CID engine family to meet the 3.4 gpm CO standard for the 1981 and 1982 model years. In reaching this decision, I have concluded on the basis of new information not available for my original decision that this engine family is capable of meeting the 3.4 gpm CO standard without the addition of any components or adjustments to the available 1981 engine-emission control system.[19]

Appendix A applies a "modified" Monte Carlo statistical simulation technique to certification emission data from Renault's 85 CID certification vehicle. This modified statistical simulation technique is similar to the simulation technique used in previous suspension and waiver decisions to project the likelihood that a given engine family will be capable of certifying to applicable emission standards.[20] That technique included consideration of certain variabilities in projecting the likelihood of successful certification on the basis of emission data from pre-production development vehicles.[21]

[12] Much of this information was gathered for and included in the record for the previous consolidated CO waiver decisions. See EPA Public Dockets EN-79-4, EN-79-17, and EN-79-19. Those records have been incorporated by reference into the record for this fifth consolidated decision, EPA Public Docket EN-80-1.

[13] Report by the Committee on Motor Vehicle Emissions of the National Academy of Sciences, dated November 1974. See also discussions of the applicability of NAS studies in previous CO waiver decisions; e.g., 44 FR at 53376, 53386 (September 13, 1979) and 44 FR at 69416, 69423, 69428 (December 3, 1979).

[14] See, e.g., 44 FR 53376, 53386 (September 13, 1979), 44 FR 69416, 69428 (December 3, 1979).

[15] 44 FR 69416 (December 3, 1979).

[16] R. Reapp., p. 1-2. February 12, 1980 Transcript, p. 12.

[17] February 12, 1980 Transcript, p. 13-16.

[18] February 12, 1980 Transcript, p. 13. The Selective Enforcement Audit (SEA) program applies the Federal Test Procedure to a representative sample of production vehicles from a particular specified vehicle configuration selected from a particular assembly plant in order to determine whether the production vehicles of that configuration are meeting Federal emission requirements. The "Acceptable Quality Level" (AQL) is the maximum percentage of a configuration's total production vehicle population which could fail to meet Federal emission requirements before that configuration will incur more than a five-percent likelihood of failing an SEA. See 41 FR 31474 (July 28, 1976) and 44 FR 69416 (Dec. 3, 1979).

[19] Cf. My previous denial of a waiver request for this engine family, 44 FR 69416, 69428 (Dec. 3, 1979). See also App. A, section V.

[20] The Monte Carlo simulation technique used in these previous decisions is discussed more fully in the following:

Appendix B, Technical Appendix to the Decision of the Administrator on Remand for the United States Court of Appeals for the District of Columbia Circuit, April 11, 1973.

Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1976 Motor Vehicle Exhaust Emissions Standards, July 30, 1973.

Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1977 Motor Vehicle Exhaust Emissions Standards, March 5, 1975.

38 FR 10317, 10323 (April 26, 1973).

44 FR 53376, 53380 (Sept. 13, 1979).

44 FR 69416, 69421 (Dec. 3, 1979).

45 FR 7122, 7123 (Jan. 31, 1980).

[21] The statistical treatment of the data examined in EPA methodology in previous decisions used a technique employed by Central Motors in Volume III, Appendix 27, of its March 5, 1973 submission. EPA used the Monte Carlo technique to calculate the expected distribution of emission results that would occur if an experiment (in this case, testing a vehicle up to 50,000 miles) were to be repeated. The EPA methodology considers three types of variability when making such calculations: (1) Car-to-car variability; (2) test-to-test variability; and (3) variability in deterioration rate of emissions performance.

Footnotes continued on next page

However, because data from actual certification "durability" vehicles are now available for the 1981 model year 85 CID engine family, certain terms which in previous decisions had been incorported in the Monte Carlo simulation to account for variabilities in emissions performance are no longer relevant.[22] EPA has therefore modified the Monte Carlo simulation technique used in earlier decisions by eliminating those variabilities which are no longer applicable when evaluating actual certification emissions data.[23] This modified Monte Carlo technique, when applied to the actual certification emissions data, is a better indicator of an engine family's capability to meet emission standards in certification.

Even with no improvement factors for additions to the emissions control systems, this modified Monto Carlo analysis indicates with a high degree of statistical confidence that Renault's 85 CID engine family is capable of certification at the 3.4 gpm CO standard for the 1981 and 1982 model years. This modified Monte Carlo analysis thus gives me a basis for determining that effective emissions control technology is available.[24]

In addition to the modified Monte Carlo analysis, EPA also used available certification test results to anticipate the ability of Renault's 85 CID Engine family to complete certification testing successfully through 50,000 miles by applying a least-squares straight-line fit to the emission data.[25] This method, which EPA uses as part of its certification program to determine compliance with emission standards, supports the conclusion reached above using the modified Monte Carol simulation.[26] Thus, with a significant portion of the durability certification testing complete, the least-square straight-line fit of the available certification data indicates that this engine family most likely will pass certification at a level comfortably below the 3.4 gpm CO standard.[27]

I also have considered Renault's contention that production vehicles of this engine family may fail future Selective Enforcement Audit (SEA) requirements even though the engine family may pass certification.[28] Renault provided information regarding the formulation of the emission target levels it sets for its prototype vehicles to afford what it deems to be adequate assurance that its vehicles will be likely to meet Federal emission requirements for vehicles in actual production and use.[29]

Application of this formula to the 1981 model year emission standards produces a low-mileage CO emission target slightly below the low-mileage emission levels Renault achieved for its 85 CID engine family in certification and on some of its development vehicles.[30] However, comparison of Renault's emission design targets and certification test results for previous model years indicates that Renault has actually chosen to produce vehicles which exceeded these earlier emission design targets by margins comparable to the margins present here. Thus Renault has failed to establish that it will be unable to produce this engine family in compliance with a 3.4 gpm CO standard because of the possible inability of its production vehicles to meet SEA requirements as evidenced by its failure

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Footnotes continued from last page

Car-to-car variability results from the fact that two vehicles, built as identically as possible, can produce different emissions levels.

Back-to-back tests on the same car can produce different measured emissions values.

Vehicles that are nominally the same can, if run to 50,000 miles, experience different rates in deterioration of emissions performance.

The Monte Carlo technique accounts for these variabilities in projecting the likelihood of successful certification. See Appendix B, Technical Appendix, to the Decision of the Administrator on Remand for the United States Court of Appeals for the District of Columbia Circuit, April 11, 1973, pp. 38–44.

[22] In order to determine conformity with Federal emission standards, EPA requires emissions testing of a prototype "durability vehicle" at approximately 5,000-mile intervals while that vehicle accumulates 50,000 miles. 40 C.F.R. § 86.080–26(a)(4) (1978). Where these data are available for an engine family, car-to-car, test-to-test, and deterioration rate variabilities no longer need be taken into account in projecting the likely measured emissions of actual certification tests. For further explanation, see App. A, section III.

[23] The "modified" Monte Carlo technique, which this decision employs for Renault's 85 CID engine family, still takes into account some emissions performance variabilities that could occur in completing certification testing for this engine family over extended mileage. Specifically, the analysis accounts for car-to-car, test-to-test, and deterioration factor variabilities that could occur while Renault completes testing on its certification vehicle through 50,000 miles. This decision includes analysis of emissions data through 40,000 miles. See App. A, section III, V.

[24] This engine family marginally fails the Monte Carolo analysis as applied in previous decisions, but passes the more accurate modified Monte Carlo technique applied to the certification emission data available here. See note 23, supra and App. A., section III, V.

[25] 40 CFR 86.079–28(a)(4)(7)(B). EPA uses the least-squares method to interpolate emission results in order to fit a straight line to the scattered 5,000-mile interval emission data points of a certification durability vehicle in determining whether or not that vehicle has met the emission requirements of the certification program.

[26] App. A, section V.

[27] Although the least-square method is an interpolative rather than a predictive methodlogy, it does accurately reflect emissions performance through the 40,000 miles of testing already completed. App. A, section V. See also discussion of certification results used in previous decisions. 44 FR 69416, 69426 (Dec. 3, 1979), and note 35, 45 FR 7122, 7125 (Jan. 31, 1980). Appendix A also applies the same Monte Carlo technique as used in previous decisions with the addition of a factor for emissions improvement for a start-oxidation catalyst on Renault's open-loop oxidation catalyst system. With the addition of these components, which may be available for the 1982 model year, the "standard" Monte Carlo simulation predicts that the 85 CID engine family could meet the 3.4 gpm CO standard. Renault established that these improvements are not available for the 1981 model year due to lead-time constraints. App. A, section V. A factor for a clean-up oxidation catalyst with switched-air to be used with Renault's closed-loop three-way catalyst system was also developed for this engine family in the second consolidated decision. 44 FR 69416, 69444 (Dec. 3, 1979). Renault failed to establish that space constraints precluded the addition of these components. However, Renault did establish that because of lead-time considerations Renault could not incorporate these components in the 85 CID engine family until the 1982 model year. App. A, section V. Because of the newly-available certification data, however, I no longer need to rely on this factor in determining whether effective CO control technology is available for this engine family.

[28] February 12, 1980 Transcript, pp. 12–16. See also 44 FR 69416, 69427 (Dec. 3, 1979) for a discussion of manufacturers design targets.

[29] R. App. Sept. 1979, Supplemental Submission, section V.

[30] The formula Renault uses to calculate emission test data targets is shown below (see R. App. p. 4.1 of additional submission September 24, 1979):

Emission Standard

Engineering Goal = D. F./K − δ map

K is a "coefficient which takes account of the difference in average emissions and the variability between 0-mile production vehicles and 4000 mile development vehicles" (i.e., a coefficient accounting for prototype-to-production slippage). R. App., September 1979, Supplemental submission p. 4.1. EPA assumed a K value of 1.3 based upon Renault's own approximation. Id. at 4.2. The DF is the deterioration factor developed from emission "durability" testing, and σ map is the standard deviation corresponding to the variability of emission results of 4000-mile development vehicles.

Renault Emission Goals Compared to Results

Certification testing 1981	4000 mile HC goal/HC results	4000 mile CO goal/CO results	4000 mile NO_x goal/NO_x results
		2.8***/2.6	
09/05/79	0.30/0.18	5.24/0.84	1.45/1.37
11/01/79	0.24/0.19	5.90/4.74	0.67/0.31
06/30/78	1.15/1.13**	11.1/11.5*	1.54/1.68*
08/10/78	1.09/0.25	8.27/2.1	1.15/1.05**
10/23/78	1.09/0.39	8.27/3.8	1.54/1.37
10/23/78B	1.09/0.35	8.27/3.1	1.54/1.32
01/10/78	1.13/1.33*	11.4/10.5	1.54/1.64*
07/10/78	1.13/1.35*	11.4/10.7	1.54/1.69*
02/24/78	0.93/0.29	11.3/2.6	1.26/1.04

The above table uses low-mileage emission test results and estimated design targets based on deterioration factors from Renault's applications for certification for the 85 CID engine family which Renault produced in the 1979, 1980, and 1981 model years. All values are calculated using the Renault formula without δ map. However, EPA also considered the representative "system variability" δ map values from various Renault emission control systems (R. App. Sept. 1979, section V) as listed below. Use of any δ map value in the engineering goal calculation serves only to lower the engineering goal.

Model	810R	810RC	1980 49-state	Three-way catalyst + feedback carburetor
HC	0.10	0.033	0.03	0.035
CO	1.2	0.3	0.3	0.45
NO_x	0.16	0.2	0.2	0.10

*Indicates examples where test results exceeded design targets. For example, for the CO values taken from certification testing dated 6/30/78, the CO certification test results exceed the engineering goal of 11.1 by 0.4 gpm. If any value for δ map was included, the CO test results would exceed the engineering goal by an even greater amount.

**Indicates examples where test results exceed design targets when subtracting EPA assigned average δ map values calculated from the above δ map figures (i.e., when the average δ map value is subtracted from the goal in each column).

***EPA interpolated.

to meet these design targets in certification testing.[31]

Consideration of costs, driveability, or fuel economy offers no basis for altering my conclusion that Renault has failed to establish that effective emissions control technology is not available for its 85 CID engine family. Since the engine family/emissions control system for which Renault has requested this waiver is the same system which is currently projected to pass 1981 certification at the 3.4 gpm CO level, Renault has not demonstrated any cost, driveability or fuel economy differentials between a system it plans to use under a 7.0 gpm CO standard and one targeted to meet the 3.4 gpm CO standard.[32]

2. Peugeot

Peugeot applied for a waiver to a CO standard of 5.5 gpm for its 174 CID engine family for the 1981 and 1982 model years. In support of this application, Peugeot provided some emission test data and other information regarding space constraints of alternative emissions control systems. Peugeot contended that its "prime" system, employing fuel injection, was unavailable for those model years because of space limitations and lead time problems both related to Peugeot's ability to incorporate the closed-loop fuel injection system on the 174 CID engine family.[33] As a result, Peugeot claimed that the best emissions control system available for this engine family was its 1980 dual feedback carburetor system with minor improvements to the choke and some other components.[34] Peugeot also contended that this current 1981 system was incapable of meeting its own design targets.

However, Peugeot has not provided any durability emission data on this engine family as Peugeot plans to use it in its 1981 model year vehicles.[35] As I stated in the Guidelines for Waiver Applications [36] and in previous waiver decisions,[37] the manufacturer must provide sufficient emission data to permit me to assess adequately the durability of its emission control capabilities to meet Federal emission standards for the 1981 and 1982 model years through the use of the Monte Carlo statistical simulation employed in past decisions.

Instead, the only data Peugeot provided were low-mileage development data, which indicate compliance with the 3.4 gpm CO standard at that low mileage, and give me no basis for concluding that this engine family cannot continue to meet this standard in certification or in production. The only information Peugeot provided on the likely emissions durability characteristics of the 1981 engine family was the "deterioration factor" (DF) from its 1980 predecessor, which indicates no projected CO emissions control deterioration over the 50,000 mile statutory engine life.[38]

EPA applied the standard Monte Carlo simulation to Peugeot's low-mileage data by projecting from Peugeot's 1980 DF the additional data points required to perform this analysis. This statistical simulation accounts for test-to-test, car-to-car, and DF variability in conservatively analyzing Peugeot's ability to certify. The Monte Carlo simulation performed with Peugeot's low-mileage emissions data, even without hypothesizing any technological improvements, provided no indication that this engine family is not capable of meeting the 3.4 gpm CO standard.[39]

Peugeot has also failed to establish that it would be unable to produce this model even though this engine family did not meet Peugeot's design targets. Peugeot calculated its design targets for a 3.4 gpm CO standard on the basis of a mean emission variation derived from 1979 and earlier model year production vehicles designed to meet a 15 gpm CO standard.[40] Peugeot has not established that the variation based upon production vehicles designed to meet the 15 gpm CO standard would be as great for production vehicles designed to meet a 3.4 gpm CO standard. Nor did Peugeot support the mean value which it employed for this standard variation by providing emission data on the individual production vehicles from previous model years which it used to calculate that mean value.[41]

Considerations of costs, driveability, or fuel economy offer no basis for altering my conclusion that Peugeot has failed to establish that effective emissions control technology is not available for its 174 CID engine family.[42] Peugeot did not raise driveability or fuel economy as issues and did not provide any information to support claims based upon these factors. In addition, Peugeot has not established any cost differential between the system covered by this waiver request for a 5.5 gpm interim CO standard and a system it would need to meet the 3.4 gpm CO standard because Peuget claims that it has no system available to meet the 3.4 gpm CO standard in the 1981 and 1982 model years. I am, therefore, unable to determine that effective emissions control technology, considering costs, driveability and fuel economy, is unavailable for Peugeot's 174 CID engine family for the 1981 and 1982 model years.

B. Protection of Public Health

According to the express terms of the statute, there is no need for me to determine whether waiver applications covering engine families for which applicants failed to establish the unavailability of effective control technology (considering costs, driveability, and fuel economy) meet any of the remaining statutory criteria in order for me to deny these applications. The Act requires me to deny waiver applications where an applicant has failed to meet any one of the criteria, regardless of whether such applicant could meet the remaining criteria. Nevertheless, I will address these issues briefly in the course of discussing the remaining criteria as I have done in the four previous waiver decisions.

Section 202(b)(5)(C) of the Act states that before I grant a waiver covering a given engine family, I must find that protection of the public health does not require attainment of a 3.4 gpm CO standard by the vehicles of the engine family receiving the waiver.[43]

While waiving the 1981 and 1982 statutory CO standards for either of the engine families here arguably would not significantly affect the public health, noticeable increases in ambient CO

[31] For the 1981 model year, EPA estimates a CO design target of 2.8 gpm and 4000-mile interpolated certification results of 2.6 gpm CO.

[32] App. A, sections VI, VII, VIII.

[33] P. App. pp. 8, 25. February 12, 1980, Transcripts pp. 58–59, 64–66.

[34] February 12, 1980 Transcript, p. 60. See also Appendix A, section V.

[35] February 12, 1980 Transcript, pp. 70–73. See also App. A, section V.

[36] 43 FR 47272, 47276 (October 13, 1978).

[37] See 44 FR 53376, 53385 (September 13, 1979), 44 FR 69416, 69427 (December 3, 1979), and 45 FR 7122, 7123, (January 31, 1980).

[38] February 12, 1980 Transcript, pp. 71–73.

[39] The requirements for Monte Carlo analysis are stated in the Guidelines for Applications, 43 FR 47272, 47276, (Oct. 13, 1978). In fact, the low-mileage data Peugeot did supply indicated a good possibility that this engine family could meet a 3.4 gpm CO standard in the 1981 model year. See App. A, section V. Low-mileage data are as a rule insufficient to support granting a waiver except where a manufacturer is eligible for and has received an assigned DF. Cf. my decision regarding Lotus' CO waiver requests, 45 FR 7122, 7125 (Jan 31, 1980).

[40] P. App., Appendix I (section 5).

[41] Cf. 44 FR 53384 (September 13, 1979) (addressing concerns similar to Peugeot's which other CO waiver applicants have raised).

[42] App A, sections VI, VII, and VIII.

[43] These criteria are found in section 202(b)(5)(C) of the Act. For discussion regarding these criteria in earlier waiver decisions, see 44 FR 53376, 53378 (September 13, 1979) and 44 FR 69416, 69420 (December 3, 1979), 45 FR 7122, 7126 (January 31, 1980).

levels could result from granting waivers industry-wide.[44] In light of the fact that industry-wide waivers would not be protective of the public health, it is reasonable to grant waivers covering only that portion of the industry consisting of engine families for which I have determined that effective control technology, considering costs, driveability, and fuel economy, is not available (presuming these families also meet the remaining statutory criteria).[45]

C. Essential to the Public Interest or to the Public Health and Welfare

Before I may grant a waiver request, section 202(b)(5)(C)(i) of the Act requires that I determine that granting the waiver is essential to the public interest or the public health and welfare.[46]

I have determined that it is not essential to the public interest to grant waivers to the Renault and Peugeot engine families where the applicants have failed to establish that these engine families are incapable of meeting a 3.4 gpm CO standard or are likely to incur significant costs (or driveability or fuel economy penalties) in meeting that standard. Neither Renault nor Peugeot has established that the costs (or other penalties) involved are so substantial as to present a significant risk to the waiver applicant's ability to produce and competitively market vehicles of that engine family, or vehicles generally.[47]

D. Good Faith

In order for me to grant a waiver to any applicant, section 202(b)(5)(C)(ii) of the Act [48] requires that I determine that the applicant in question has made all good faith efforts to meet the established emission standards. As a result, I have examined information regarding each applicant's previous and projected efforts toward meeting a 3.4 gpm CO emission standard for the engine families in question.

Each of the waiver applicants has provided information to support the contention that it has acted in good faith in trying to meet the 3.4 gpm CO standard. There is not sufficient information in the record currently to support a determination that either of the applicants has failed to meet the Act's good faith criterion in developing emission control technology to meet the 3.4 gpm CO standard.

However, the progress Peugeot has made in developing a closed-loop fuel injection system has not proceeded as quickly as I normally would expect. Peugeot stated at the public hearing that it believes it needs this fuel injection system to meet a 3.4 gpm CO standard and has been aware of the problems in incorporating this system since 1977,[49] yet still feels it cannot complete development and adaptation of that system before the 1983 model year. However, since I have denied Peugeot's waiver request on the grounds that Peugeot has failed to establish the effective emissions control technology is unavailable, I need not reach a final determination regarding whether Peugeot has met the good faith criterion of the Act.[50]

E. Risks in Determining Available Technology

In *International Harvester Co, v. Ruckelshaus,*[51] the United States Court of Appeals for the District of Columbia Circuit reviewed the administrator's decision to deny manufacturers' request for a one-year suspension (from 1975 to 1976) of the effective date of the statutory hydrocarbon (HC) and CO standards mandated by the 1970 version of the Act. The court stated, among other things, that the Administrator should have considered the risks associated with the possibility of erroneously granting or denying those requests. The court indicated that the Administrator should balance the economic costs (in terms of jobs and misallocated resources) possibly associated with an erroneous denial versus the possible environmental benefits lost through an erroneous grant. Even though the health risks associated with erroneous grants in the proceedings at hand may not be great, the risks associated with erroneous denials (which do not involve health considerations) also are limited significantly. My findings that technology is available for an engine family to meet certification testing requirements are based on conservative projections.[52] The move from today's state of technology to the technology required to achieve the 3.4 CO standard does not require any substantial shift to untried emission control methods. Furthermore, an incorrect determination here would have the potential to adversely affect the production of only one engine family, as opposed to the ability of the industry as a whole to produce cars for the public generally. In light of these counter-balancing risks, and in light of Congress' expressed intent to afford a statutory waiver only in exceptional circumstances rather than on an across-the-board basis,[53] I have concluded that it is appropriate to deny waiver applications insofar as they cover engine families for which the manufacturer has failed to establish that effective control technology, considering costs, driveability, and fuel economy, is not available.

IV. Conclusion

I have determined for Renault's 85 CID engine family that effective control technology is available to meet a 3.4 gpm CO standard by the 1981 model year, even after considering costs, driveability and fuel economy. In addition, I have determined that Peugeot has failed to provide information sufficient to establish that such technology, considering costs, driveability, and fuel economy, is not available for its 174 CID engine family in

[44] Each of these applicants argued that granting a waiver to each of these engine families would have an insignificant impact especially considering total projected sales. For further discussion concerning these contentions see the first decision, 44 FR 53376, 53381, and Appendix B at 44 FR 53402–53407 (September 13, 1979).

[45] I discussed the ambient air quality effect of granting CO waivers in each Appendix B in two previous decisions, 44 FR 53376, 53402–53407 (September 13, 1979) and 44 FR 69416, 69456–69462 (December 3, 1979).

[46] Previous decisions discussed more fully the public interest and public health and welfare effects of engine families denied waivers. 44 FR 53387, 44 FR 69429 (September 13, 1979 and December 3, 1979).

[47] This point was discussed in the public interest analysis section in previous decisions regarding engine families denied waivers. 44 FR 53376, 53385 (September 13, 1979) and 44 FR 69416, 69430 (December 3, 1979), 45 FR 7122, (January 31, 1980), 45 FR 7914 (March 19, 1980). Appendix A contains a closer examination of these issues. App. A, section V–IX.

[48] 42 U.S.C. 7521(b)(5)(C)(ii).

[49] February 12, 1980 Transcript, at p. 90. Cf. App. A, sections V, IX. In addition, Peugeot supplied emission data from only sixteen tests, all low-mileage, on its 1981 system. Lack of development testing of this system could be considered as another indication of the sufficiency of good faith development effort to meet the 3.4 gpm CO emission standard.

[50] The sufficiency of good faith development efforts would continue to be an issue in the event that a manufacturer should reapply for a waiver, as would the other statutory criteria. See note 61, 44 FR 69417, 69424 (December 3, 1979).

[51] 478 F.2d 615 (D.C. Cir. 1973). For further discussion of this case, see 44 FR 53376, 53388 (Sept. 13, 1979).

[52] See section III(A)(1), supra. See also App. A, sections III, V. Although the Monte Carlo technique employed here differs slightly from that used in previous decisions, this "modified" Monte Carlo produces a more accurate projection of likelihood of successful certification while still maintaining conservative variabilities where necessary. See the discussion in section III(A)(2). See also, App. A, section III, V.

[53] See also discussion of the *International Harvester* case in two previous decisions. 44 FR 53376, 53387 (September 13, 1979), 44 FR 69416, 69429 and 69430 (December 3, 1979). In my fourth consolidated decision I based my decisions to grant waivers due to potential risks on two factors: (1) The severity of the adverse economic consequences which could occur as the result of an erroneous denial and; (2) the likelihood that a denial, in fact, will turn out to be ill-founded. 45 FR 17914, 17917 (March 19, 1980). Neither Renault nor Peugeot has established that factors such as these contradict my findings here.

the 1981 and 1982 years. Therefore, I must deny the waiver requests for these two engine families.

Dated: May 14, 1980.

Douglas M. Costle,

Administrator.

Appendix A—Summary of Technological Capability

Contents

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I. Introduction

The exhaust emission standards for 1981 and later model year light-duty vehicles are currently 0.41 gram per mile HC, 3.4 grams per mile CO, and 1.0 gram per mile NOx. Section 202(b)(5)(A) of the Clean air Act, as amended, 42 U.S.C. 7521(b)(5)(A) provides the opportunity for manufacturers to request a waiver of the 3.4 grams per mile CO standard to 7.0 grams per mile during model years 1981 and 1982.

The applicants being considered in this document are Peugeot and Renault. This is the fourth group of CO waiver applications that have been considered by EPA. This is the second time that a waiver request has been considered by EPA from Renault. General Motors has again requested a waiver for one of their engines, and Ford has requested waivers for two of their engines. The Ford and General Motors requests will be discussed in a later document.

This appendix deals with the technological capability of Peugeot and renault to meet the 1981 and 1982 CO standard of 3.4 grams per mile. This appendix relies on three previous technical appendixes, particularly for discussion of the Monte Carlo simulation utilized in this analysis. These appendixes are:

1. Appendix B, Technical Appendix, to the Decision of the Administrator on Remand for the United States Court of Appeals for the District of Columbia Circuit, April 11, 1973.

2. Appendix A, Technical Appendix, to the Decision of the Administrator In re : Applications for Suspension of 1976 Motor Vehicle Exhaust Emission Standards, July 30, 1973.

3. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1977 Motor Vehicle Exhaust Emission Standards, March 5, 1975.

As indicated in Section 202(b)(5)(c)(iii), the technological feasibility determination is based on the consideration of technological capability, cost, driveability, and fuel economy. This appendix contains discussion of each of the above topics.

II. Summary of Technological Capability

Tables II–1 and II–2 summarize the capability of the applicant manufacturers to meet the 1981 and 1982 emission standards. The standards considered in these tables are 0.41 HC, 3.4 CO, 1.0 NOx.

A guide to the summary tables is as follows. The first column lists egine displacement. The "as received" column refers to the emission data submitted by the manufacturer. "Improvements" refer to the projected technological improvements (factors) applied to the data submitted by the manufacturer.

The "no data" category is an abbreviated notation for the lack of acceptable data to perform EPA's established technological analysis as referred to in EPA's published CO waiver guidelines. The applicants have known for about six years what sort of data is necessary for EPA to make a determination under its established methodology whether or not a given vehicle would be projected to pass or fail a set of standards. Unfortunately, in one case there was a lack of useable data for vehicles using a specific engine. This effectively precluded EPA from making a pass/fail determination for those vehicles through the established methodology. In these cases the vehicles using these engines are called "no data" and no pass/fail determination was made.

Table II–1.—*Applicant: Peugeot*

Engine	Pass as received?	Pass with improvement?
174 CID	No data	N/A*

Table II–2.—*Applicant: Renault*

Engine	Pass as received?	Pass with improvement?
85 CID	Yes	N/A

* N/A means not applicable or that no hardware improvement factors were applied to these vehicles.

III. Statistical Treatment of the Data

No changes have been made in the standard Monte Carlo methodology since its last use in a technical appendix. This methodology has been discussed in three previous technical appendixes:

1. Appendix B, Technical Appendix, to the Decision of the Administrator on Remand for the United States Court of Appeals for the District of Columbia Circuit, April 11, 1973.

2. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1976 Motor Vehicle Exhaust Emission Standards, July 30, 1973.

3. Appendix A, Technical Appendix, to the Decision of the Administrator In re: Applications for Suspension of 1977 Motor Vehicle Exhaust Emission Standards, March 5, 1975.

A new Monte Carlo simulation has been developed to handle a new situation which has arisen in this waiver proceeding. The new situation is that the Administrator must make a discision to grant or deny waivers based on actual certification vehicles with less than complete mileage accumulation for a given model year which is also a year for which a waiver has been requested. Specifically, the circumstance is that Renault has a 1981 model year durability vehicle (vehicle 785) in EPA certification. Car 785 has currently accumulated over 40,000 of the mandatory 50,000 miles of durability mileage accumulation. Based on all current emission data points, the vehicle meets the 1981 emission standards. Based on the least-squares-fit straight line through all current data, the vehicle is projected to pass the 1981–1982 standards. Based on the standard Monte Carlo methodology, the vehicle is projected to marginally fail CO emissions.

The situation brought about by Renault vehicle 785 has not arisen in previous waiver decisions. If the Renault vehicle had completed the 50,000 miles at the projected emission levels, the waiver would have probably been denied. And if the Renault vehicle were a prototype development vehicle instead of an actual 1981 certification vehicle, the vehicle would clearly be considered to fail as in previous decisions.

The Monte Carlo is used to predict the probabilities of an untested certification vehicle passing the emission standards based on the test data from a prototype durability vehicle of identical construction. Car-to-car variability, test-to-test variability, and deterioration factor variability are applied to the prototype vehice data. Use of the standard Monte Carlo methodology in the case of the Renault certification vehicle would be inappropriate to determine the probability of passing certification because the three variabilities would be applied to vehicle

results for which there is no real life variability; i.e., the first 40,000 miles of data are actual certification data and will be used precisely as they exist to determine pass/fail in certification.

Because of the inappropriateness of the standard Monte Carlo for predicting the certification results of actual certification vehicles, a modified version of the Monte Carlo was developed such that the predictive methodology could be validly applied to certification vehicles.

In the standard Monte Carlo program, the following steps take place:

1. A d.f. value and a 50,000 mile intercept are calculated from the actual vehicle data and are input into the program.

2. The Monte Carlo program calculates the 4,000 mile intercept.

3. A random 4,000 mile point is selected from the normal distribution of car-to-car variability centered around the calculated 4,000 mile point.

4. A new d.f. line is fitted through the randomly selected 4,000 mile point. This new or second d.f. line is an increment of the actual d.f. line. This increment is randomly selected from the d.f. variability distribution.

5. From the adjusted d.f. line, which passes through the adjusted 4,000 mile point, temporary points are then calculated at mileage increments of 5,000, 10,000, and 15,000, etc. Final values for these points are then chosen by randomly applying test-to-test variability to the temporary emission values.

6. A d.f., a 4,000 mile intercept, and a 50,000 mile intercept are calculated from the data points generated in step five.

7. The preceding steps are repeated 100 times.

In the Modified Mont Carlo for Certification Vehicles, the variability distributions for car-to-car, d.f. and test-to-test variabilities are not applied to actual certification test points. The variabilities are only used for the projected test points.

In the Modified Monte Carlo for Certification Vehicles, the following steps take place:

1. A d.f. value and a 50,000 mile intercept are calculated from the actual certification data and are input into the program.

2. The Monte Carlo program calculates the first projected test point beyond the actual test points.

3. A random value is selected for the first projected data point. For instance, if certification test data includes the 40,000 mile test point, the first projected point would be the 45,000 mile point. The value for the first projected point is randomly selected by applying car-to-car variability should not exist because there is no change in vehicles, this portion of the calculation adds conservatism to the analysis.

4. A new d.f. line is fitted through the randomly selected value for the first projected point. This new or second d.f. line is calculated by adding or subtracting a d.f. increment to the original d.f. line. This increment is also picked at random, from the d.f. variability distribution.

5. From the adjusted d.f. line, which passes through the adjusted value for the first projected data point, points are picked at 5,000 mile increments of up to 50,000 miles. Values are also projected for before and after scheduled mainatenance test points. The values for these data points are randomly selected from the test-to-test variability distribution.

6. A d.f., a 4,000 mile intercept, and a 50,000 mile intercept are calculated from all the data points, both actual and projected.

7. The preceding steps are repeated *1000* times.

In the Modified Monte Carlo for Certification Vehicles, it should be apparent, from the preceding explanation, that the variability distributions for car-to-car, d.f. and test-to-test variabilities are only used in conjunction with the projected data points, and not with acutal certification test points. The values of the variabilities are identical to those used in the standard Monte Carlo. Also the modified Monte Carlo is used only to analyze incomplete 1981 model year certification vehicles.

IV. Factors

With respect to the vehicle emission data submitted by the manufacturers for EPA analysis, vehicles are often run and tested over durability mileage accumulation schedules without using the best technology that is available to the manufacturer for certification in the 1981 or 1982 model years. There are many reasons why this occurs. First, such technology may have simply not been available in quantity when fleets of vehicles began mileage accumulation. Second, all vehicles submitted for EPA staff analysis may not have been specifically designed for the 1981 and 1982 Federal emission standards. Also the manufacturer may wish to maintain some technologies (with known durability) in reserve if their low mileage testing indicates that such technology may not be needed for compliance with the target emission standards. In addition, technology may not appear on durability vehicles because the manufacturer has made a decision that the technology would be too costly for production vehicles.

To account for the fact that the applicants did not in all cases conduct durability testing with the most effective emission control hardware, factors have been applied to some of the emission data submitted by the manufacturers to simulate the addition of more effective systems. Due to substantial lead time problems for implementation of new or additional technology by the 1981 model year, these factors have been applied only for currently known hardware that can be implemented in 1981 or 1982 certification and production. These improvements have been basically limited to additional catalyst (i.e., the addition of oxidation catalyst in some cases), the addition of air injection, and additional catalyst noble metal loadings. Other improvements in hardware were considered if the manufacturer indicated that they were available for 1981 or 1982.

The factors that have been applied to the data are dimensionless numbers that represent the improvement in emission performance that is predicted for the more effective simulated emission control technology. The factors are derived from data that reflect the emission performance of a vehicle with and without the more effective technology. For example a factor for CO of 0.90 indicates that a 10% reduction in CO is projected for the use of the more effective technology. In addition, when there are several different sources for the same improvement, EPA uses a conservative estimate of that projected factor, i.e., a factor greater in absolute value than that indicated by most of the data.

Other factors which were developed, but generally not used in the following analysis include factors for:

- Warm up catalysts for 3W catalyst or 3W+OC systems
- Deletion of power enrichment
- Use of insulated or dual-walled exhaust pipes
- Use of exhaust port liners
- Use of throttle body fuel injection
- Use of multiple point fuel injection
- High energy ignition

Although the deletion of power enrichment and the use of insulated or dual-walled exhaust pipes were considered feasible for 1981, they were generally not used. Therefore, through these additional techniques, the manufacturers may have some additional cushion for certification over and above the factors used in EPA's analysis. Use of the other items was not considered possible for most manufacturers for most engine families before the 1982 model year.

Oxidation Start Catalyst Factor

The available CO control technology includes light-off or start catalysts. Start catalysts are small in size, have low thermal inertia and are mounted close to the engine. This combination of factors leads to rapid light-off for the start catalyst, which tends to lower HC and CO emissions. The data used to develop the oxidation start catalyst factor [11 at 4–14]* are shown in Table IV–1. This factor was used on Renault durability vehicle 785.

Table IV–1.—*Start Catalyst Effect*

	HC	CO	NO_x
	0.48	0.36	1.01
	0.62	0.45	1.00
	0.70	0.66	1.00
	0.60	0.01	0.98
	0.57	0.46	0.90
	0.68	0.72	1.20
Average factor as calculated	0.6	0.6	1.0
Factor as used in Monte Carlo	.7	.7	1.0

a. Peugeot

Peugeot has applied for a CO waiver for their 174 CID V–6 engine. Peugeot stated that their first choice emission control system for meeting the 1981–1982 standards includes: CL–EFI/3W/OC/Swt. AIR with one oxygen sensor for each exhaust manifold, also referred to as "stereo" oxygen sensors.

According to Peugeot, an electronic fuel injection system with stereo oxygen sensors will not be available until the 1983 model year. Because of the claimed unavailability of the preferred system, Peugeot's first choice system for the 1981–1982 model years was changed to include: FBC/3W/OC/Swt. AIR/EGR. This system also includes stereo oxygen sensors. This first choice system differs from their 1980 emission control system in three ways: (a) increased air flow in the AIR system, (b) an improved automatic choke, and (c) stoichiometry is maintained at full load.

Table V–1 lists the vehicles included in Peugeot's waiver application. To aid in distingusihing between vehicles which were submitted with the same vehicle number, EPA added a suffix. The vehicles included in Appendixes 3 and 5 of reference 3 have the three improvements listed above [12 at 1]. The standard Monte Carlo methodology was used for all the Peugeot vehicles included in the Monte Carlo analysis.

V. Discussion of Individual Manufacturer's Technical Capability

This section will discuss all vehicles which (1) were submitted by each of the two applicants (2) also are acceptable for input into the Monte Carlo simulation. Accpetable for input means (1) that the vehicle is a durability vehicle which has accumulated a minimum of 20,000 miles with the same major emission control components and (2) that a minimum of four valid 1975 FTP tests have been conducted on the vehicle.

Details of the pass/fail determinations in section II are also presented here. To pass the 1981 and 1982 emission standard (of 0.41 HC, 3.4 CO, 1.0 NO_x), the probabilities of passing each individual pollutant must be greater than or equal to 80%. If the probability of passing only HC, for example, is less than or equal to 79%, the vehicle fails—even if the probabilities for CO and NOx greatly exceed the 80% cutpoint.

Due to the limited time for analysis, a pass/fail analysis is provided only for emission standards of 0.41 HC, 3.4 CO and 1.0 NO_x. Analysis of the capability of the vehicles to meet the standard of 0.41 HC, 7.0 CO, 1.0 NO_x was not conducted. Consequently, vehicles designed for a 7.0 CO standard are included in the following discussions of vehicles which were acceptable for entry into the computer analysis, but are not discussed with respect to compliance at 7.0 CO.

In order that the Monte Carlo analysis not be cluttered with hundreds of failing vehicles utilizing inappropriate technology, prior certification vehicles are not considered in this analysis except in special cases where a manufacturer's ability to comply with the 1981 and 1982 emissions standards is directly affected. It is not surprising that the durability vehicles from past certification would fail to achieve the 3.4 CO standard for two reasons. First, the 3.4 CO standard represents a substantial reduction in CO from prior model year standards. And second, major changes in technology are being planned for introduction in 1981 by most vehicle manufacturers to achieve the more stringent standards.

If a manufacturer's prime (prime means the system most capable of achieving the 1981 standards) 1981 emission control system has been tested in prior certification (generally 1980), these data are included in the analysis.

*The notation [W at Y] means the reference is reference number W from section V of this document at page number Y.

Table V–1.—*Vehicles in Peugot's Waiver Application*

Engine displacement in ³	Emission control system	Vehicle No.	Entered in Monte Carlo?	If not entered in Monte Carlo, why?	Reference
163	3w/OC	638308	Yes		2 at A.1.1.
163	FBC-3W/OC/IEP*/Swt. AIR	6500992	Yes		2 at A.2.1.
174	FBC/3W/OC/Swt. AIR	6578006–A	No	<20,000 miles	2 at A.2.1.
174	FBC/3W/OC/Swt. AIR/IEP/EGR	6546867–A	No	<20,000 miles	2 at A.2.3.
174	FBC/3W/OC/Swt. AIR/IEP	6579514	Yes		2 at A.2.4.
174	FBC/3W/OC/Swt. AIR/IEP	6578006–B	No	<20,000 miles	2 at A.2.5.
174	FBC/3W/OC/Swt. AIR/IEP/EGR	6576867–B	No	<20,000 miles	2 at A.2.6.
174	FBC/3W/OC/Swt. AIR	6578006–C	No	<20,000 miles	2 at A.2.7.
174	FBC/3W/OC/Swt. AIR	6603218	Yes		2 at A.2.8.
174	FBC/3W/OC/EGR/Swt. AIR	851	No	<20,000 miles	3 at App. 3.
174	FBC/3W/OC/EGR/Swt. AIR	968	No	<20,000 miles	3 at App. 3.
174	FBC/3W/OC/EGR/Swt. AIR	204	No	<20,000 miles	3 at App. 3.
174	FBC/3W/OC/EGR/Swt. AIR	644–A	No	<20,000 miles	3 at App. 3.
174	FBC/3W/OC/Swt. AIR	134–A	No	<20,000 miles	3 at App. 4.
174	FBC/3W/OC/Swt. AIR	134–B	No	<20,000 miles	3 at App. 4.
174	FBC/3W/OC/EGR/Swt. AIR	851–A	No	<20,000 miles	3 at App. 5.
174	FBC/3W/OC/EGR/Swt. AIR	851–B	No	<20,000 miles	3 at App. 5.
174	FBC/3W/OC/EGR/Swt. AIR	851–C	No	<20,000 miles	3 at App. 5.
174	FBC/3W/OC/EGR/Swt. AIR	644–B	No	<20,000 miles	3 at App. 5.
174	FBC/3W/OC/EGR/Swt. AIR	644–C	No	<20,000 miles	3 at App. 5.
174	FBC/3W/OC/EGR/Swt. AIR	644–D	No	<20,000 miles	3 at App. 5.
174	FBC/3W/OC/EGR/Swt. AIR	644–E	No	<20,000 miles	3 at App. 5.
174	FBC/3W/OC/EGR/Swt. AIR	644–F	No	<20,000 miles	3 at App. 5.

* IEP is an abbreviation for insulated exhaust pipes.

Pass/Fail Analysis for the Peugeot 174 CID Engine

Peugeot was deemed to be a "no data" case for the 174 CID engine because they failed to run any durability vehicles which were targeted for the 1981–1982 standards. For this reason, useable data was not available to analyze through EPA's established methodology.

Peugeot stated that their reason [1 at 71 to 74] for not running a 1981 durability vehicle was because even if the 1980 durability vehicle deterioration factor (d.f.) for CO of 1.0 were applied to their 4,000 mile results [2 at 28] for vehicles which included the three improvements listed previously, their calculations indicate that they would not be able to meet a 3.4 CO standard. Their argument continues that since the 1980 CO d.f. of 1.0 could not be improved upon, there is no reason to start a 1981 durability vehicle.

Table V-2.—*Typical 4000 mile results for Peugeot vehicles with 1981 improvements*

Transmission	HC	CO	NO_x	MPG
Automatic	0.22	2.5	0.43	16
Manual	0.27	2.2	0.40	16

In response to Peugeot's argument, a Monte Carlo analysis of Peugeot's 4,000 mile results for vehicles with their 1981 control system was conducted. This analysis predicted that Peugeot would pass the 1981–1982 standards when used with the 1980 durability vehicle's d.f.'s. It is emphasized that this analysis was conducted only for the purpose of refuting Peugeot's argument. This analysis is not sufficient for granting a CO waiver when it is based on an analysis of the type of low mileage data Peugeot submitted, unless the manufacturer has received an EPA assigned d.f. Peugeot did not meet these requirements for the 1980 model year.

Table V-3 lists the Monte Carlo results for Peugeot's vehicles.

Table V-3.—*Monte Carlo Results for Peugeot vehicles*

Vehicle No.	Emission control system	Probability of pass		
		HC	CO	NO_x
638308	3W/OC	98	0	99
6500992	FBC/3W/OC/IEP/Swt. AIR	63	0	0
6579514	FBC/3W/OC/Swt. AIR/IEP	96	0	0
6603218	FBC/3W/OC/Swt. AIR	99	0	100
AVG–A	FBC/3W/OC/Swt. AIR/EGR	100	88	100
AVG–M	FBC/3W/OC/Swt. AIR/	97	98	100

Vehicles AVG–M and AVG–A are EPA designated vehicle numbers which represent Peugeot's 4,000 mile results [2 at 28] for vehicles with the three improvements for 1981. Peugeot gave separate results for vehicles with automatic and manual transmissions and are distinguished by the A and M suffixes. EPA applied the 1980 Peugeot certification durability vehicle d.f.'s of 1.0 for HC and CO and 1.47 for NO_x. The other vehicles in Table V–1 were not considered for the following reasons: (1) Vehicle 638308 did not include feedback carburetion or switched AIR. (2) Vehicles 6500992, 6579514 and 6603218 did not include exhaust gas recirculation or the three improvements for 1981. Feedback carburetion, switched AIR, and EGR are all included in Peugeot's first choice system for use in 1981 and 1982.

In order for the Monte Carlo simulation to function properly, at least four test points are required. A feature of the computer program requires at least one of these points not to fall on the straight line between the 4,000 mile point and the 50,000 mile point. The 50,000 mile point was calculated by multiplying the 4,000 mile test point by the aforementioned d.f.'s. In order to generate two more test points, the 4,000 and 50,000 mile emission levels were averaged and the result was input as the 26,000 mile and 28,000 mile test points.

Two situations arose which required further manipulation for the program to run properly.

1. In cases where the third decimal place of the "4000–50,000 average" was a 5, the value for the 26,000 mile point was rounded down to two decimal places and the value for the 28,000 mile point was rounded up to two decimal places. This rounding procedure was used to maintain a straight line between the 4000 mile and 50,000 mile test points.

2. Where the 4000 and the 50,000 mile test points were equal (d.f. = 1), a simple average of these would obviously place the 26,000 and 28,000 mile points on the straight line between the 4000 and 50,000 mile points. Because the program will not run with all four points on this line, 0.01 was subtracted from the "4,000–50,000 average" for the 26,000 mile point. For the 28,000 mile point, 0.01 was added to the average. The respective addition and subtraction of 0.01 allows the straight line between the 4K and 50K points to be maintained.

These manipulations were necessary to allow the program to run. Part II of the Monte Carlo results (Deterioration Factor Calculations) indicate a slight error in the d.f. calculations which was caused by rounding to only two decimal places for the three generated test points. The EPA technical staff judged that the errors created by these procedures did not affect the pass/fail situation of the simulated Peugot vehicles.

The results indicate that vehicles AVG–M and AVG–A pass the Monte Carlo simulation. Therefore, the EPA technical staff rejects Peugot's arguments for not running a 1981 durability vehicle.

In conclusion, because Peugot failed to submit durability data on their 1981 emission control system for a conclusive Monte Carlo analysis, the 174 CID engine is considered to be a "no data" case. The data which Peugeot did submit was not sufficient to establish that technology is not available to enable Peugeot to certify their 174 CID engine in 1981.

Renault

Renault has submitted their second CO waiver application for their 85 CID Le Car engine. Renault's previous waiver request was denied because this engine passed the Monte Carlo analysis with hardware improvement factors for a clean up oxidation catalyst with a switched AIR system. In applying this factor, the EPA technical staff assumed that Renault would be able to optimize the location of the oxidation catalyst. This decision was made, despite Renault's claims to the contrary,

because Renault failed to substantiate that the catalyst location could not be changed. Renault has reapplied for a CO waiver in an attempt to substantiate that they could not meet the 3.4 CO standard. The vehicles included in Renault's waiver application are listed in Table V–4 below.

Table V–4.—*Vehicles in Renault's Waiver Application*

VIN	Emission control system	Entered in Monte Carlo	If not entered in Monte Carlo, why?	References
540	EGR/3W/OC/Swt. AIR/FBC	Yes		4 at 3–5
711	EGR/3W/OC/Swt. AIR/FBC	Yes		4 at 3–6
TP 29	EGR/3W/FBC	Yes		4 at 3–8 & 3–9
692	Control system varied	No	220,000 miles	4 at 3–13
PS 80	Control system varied	No	20,000 miles	4 at 3–14
785	EGR/OC/AIR	Yes		45 at enclosure

As shown in Table V–4, Renault submitted data on three different control systems.

These include:

1. EGR/3W/OC/Swt. AIR/FBC
2. EGR/3W/FBC
3. EGR/OC/AIR

Pass/Fail Analysis for the Renault 85 CID Le Car Engine

Based on the results of 1981 certification durability vehicle 785, the 85 CID Le Car engine is projected to pass without hardware improvements. Vehicle 785 was equipped with an EGR/OC/AIR control system.

In their original waiver request, Renault claimed that their dual catalyst control system was their first choice system for meeting a 3.4 CO standard. In the interim, however, Renault started their 1981 certification durability vehicle (VIN 785) equipped with an EGR/OC/AIR emission control system. The actual test results for this vehicle are listed in table V–5.

Table V–5.—*Test results for vehicle #785*

	Emission Results			
Miles	HC	CO	NO_x	MPG
16	0.146	2.20	0.62	25.9
4,769	0.268	2.81	0.77	28.4
10,068	0.216	2.84	0.72	28.7
12,546	0.245	2.74	0.74	27.8
12,565	0.270	2.72	0.68	26.9
15,136	0.246	2.83	0.67	27.7
20,175	0.255	2.82	0.68	27.0
25,064	0.251	2.89	0.70	28.0
25,088	0.253	2.82	0.67	27.6
30,173	0.259	2.93	0.76	27.6
34,798	0.290	2.96	0.73	28.1
37,586	0.253	2.78	0.67	28.4
37,605	0.249	2.80	0.71	29.0
40,155	0.277	2.88	0.78	27.8
Extrapolated results*				
4,000	0.25	2.78	0.71	
50,000	0.27	2.90	0.72	

* Based on less than full 50,000 mile durability.

Table V–6.—*Monte Carlo results of Renault Le Car*

VIN	Control system	Probability of Pass			Comments
		HC	CO	NO_x	
540	EGR/3W/OC/Swt. AIR/FBC	81	10	21	
711	EGR/3W/OC/Swt. AIR/FBC	97	28	98	
TP 29	EGR/3W/FBC	98	0	100	
785	EGR/OC/AIR	97	78	96	1981 Cert. vehicle.
785*	EGR/OC/AIR	100	96	100	1981 Cert. vehicle.
785-OSC	EGR/OC/AIR	100	98	96	Factors for an oxidation start catalyst.

*Probabilities calculated with the Modified Monte Carlo for Certification Vehicles, as opposed to the standard Monte Carlo analysis.

As discussed in Section III, car-to-car variability, and deterioration factor variability are applied to development vehicle data. While this is appropriate for predicting a manufacturer's ability to certify on the basis of development vehicle data, it is not appropriate to predict the results of an actual certification vehicle. The Monte Carlo program was modified to reflect the fact that actual certification test results are not subject to variability. The Monte Carlo results (Table V–6) show that vehicle 785 passes using the "Modified Monte Carlo for Certification Vehicles." Also, Table V–5 shows that the extrapolated emission values are well below the 1981–82 standards.

Vehicle 785–OSC, which is the EPA designated VIN for vehicle 785 with a hardware improvement factor for an oxidation start catalyst, also passes the Monte Carlo. Because this can not be considered a certification vehicle because of the factor applied, the standard Monte Carlo methodology was used. The EPA technical staff does not consider the addition of a start catalyst to be feasible until the 1982 model year.

Although vehicles 540, 711, and TP 29 all fail the Monte Carlo simulation, these vehicles include control systems which differ from vehicles 785 and 785–OSC. These control systems are listed in Table V–6.

Renault also has other options for the 1982 model year. With factors for a clean up oxidation catalyst, vehicle TP 29 was projected to pass in the CO Waiver Decision of May 3, 1979. As mentioned previously, in applying this factor, the EPA technical staff assumed that Renault would be able to optimize the location of the oxidation catalyst. This decision was made, despite Renault's claims to the contrary, because Renault failed to substantiate that the catalyst location could not be changed.

In their new application, Renault has substantiated that two of the three possible locations for the clean up oxidation catalyst are no feasible considering lead time constraints. However, it appears that an oxidizing catalyst substrate could be added to their present three way catalyst container. The technical staff does not agree with Renault's claim that a dual bed catalyst cannot be installed in place of their single bed three way catalyst in the fenderwell location. Measurements indicate [4 at Drawings 1 and 3] that there is substantial clearance in which to extend the length of the catalyst container. In this way, the location of the clean up oxidation catalyst would be optimized.

Due to lead time constraints, the dual bed catalyst option could not be considered until the 1982 model year. Other options for the 1982 model year include such things as an oxidation catalyst mounted where the three way catalyst is now located for faster light-off, or adding an air pump to their three way catalyst system for ported AIR on startup. Also, Table V–6 shows that

vehicle 785 passes the Monte Carlo analysis with factors for an oxidation catalyst.

In summary, the 85 CID engine is projected to pass without hardware improvements, based on the modified Monte Carlo results of vehicle 785.

VI. Cost Analysis

EPA Cost Estimates

The costing methodology used here is essentially the same as that used in the three previous CO waiver decisions [7], [8 at 53400], [9 at 69450], [10 at 7133]. Additional responses to the EPA subpeona of August 8, 1979 enabled EPA to further revise cost estimates of certain emission control devices, notably monolithic three-way and oxidation catalysts. The subpeona requested prices that suppliers charge the automobile manufacturers for emission control devices or systems.

Table VI–1 presents EPA estimates of cost to the consumer of compliance with 3.4 vs 7.0 CO (due to lead time problems for certain emission control devices, separate estimates are often necessary for 1981 and 1982). The changes in cost were calculated by individual engine size. These changes are based on the differences in emission control hardware between a) systems targeted to meet 7.0 CO, as described by each manufacturer in their applications and b) systems judged capable by EPA of meeting 3.4 CO, based on Monte Carlo results or successful 1980 or 1981 certification of similar vehicles. Cars which passed the Monte Carlo often need improved emission control hardware to do so, and in such cases these technological improvements are all costed in.

As shown in Table VI–1, EPA did not find an increase in cost for Renault's 85 CID engine to achieve 3.4 CO in 1981 or 1982. This is due to the fact that the system Renault has designated as their 7.0 CO system is the same as the system which is currently projected to pass 1981 certification.

Peugeot's 174 CID engine also displays no cost differential between 3.4 and 7.0 CO because the cost issue does not arise for engine sizes which are labeled "no data" or "fail" in the Monte Carlo analysis. In any event, Peugeot has not established that the system it would use to meet a 3.4 CO standard in 1981 needs to be any different than the system for which it has requested a waiver.

Table VI–1.—*EPA estimate—cost of compliance with 3.4 CO*

Manufacturer	CID	4 vs 7.0 CO in 1980 dollars	
		1981	1982
Renault	85	0	0
Peugeot	174	0 (no data)	0 (no data)

Manufacturers' Cost Estimates

Table VI–2 presents the manufacturers' estimates of cost to the consumer of compliance with the 3.4 CO standard over cost of meeting 7.0 CO. Renault claimed that they could not achieve 3.4 CO with any system and therefore did not differentiate between 3.4 and 7.0 systems. A cost of "0" dollars for Renault signifies that they did not specify different control systems to meet 3.4 CO and 7.0 CO. Peugeot specified a system which is targeted to meet 3.4 CO in 1983 but did not specify a cost of compliance with the 3.4 CO standard.

Table VI–2.—*Manufacturers' cost estimates*

Manufacturer	CID	Cost of compliance 3.4 CO vs. 7.0 CO
Renault	85	0
Peugeot	174	(1)

[1] Not provided.

VII. Driveability

The technological feasibility of meeting the 1981–1982 standards is, in part, determined by the applicants ability to maintain acceptable driveability while attaining these standards.

Peugeot and Renault, while maintaining that they are incapable of meeting the 1981–1982 standards, have not indicated that waviers would be necessary to maintain acceptable driveability. Renault stated [1 at 22] the driveability for their EGR/OC/AIR control systems was "tolerable" but these tests were run "in the normal temperature range" and there have "been very, very few tests". No data was submitted. Peugeot provided driveability comments for some of their low mileage vehicles. In some cases Peugeot indicated that the engine stalls at idle or on acceleration, and for others they indicated that the driveability was acceptable. Peugeot did not say that driveability would be unacceptable, and indicated that they did not have a formal driveability test procedure. Therefore, driveability is not one of the determining factors in assessing the ability of Peugeot and Renault to comply with a 3.4 g/mi CO standard.

VIII. Fuel Economy

Renault

Renault did not claim any fuel economy loss in going from 7.0 to 3.4 CO. However, they did comment that with either their three way or duel catalyst configuration, the fuel economy results are roughly the same [1 at 18]. Renault has not submitted sufficient data at the 3.4 CO level, therefore, an extensive fuel economy comparison between the two levels is not feasible at this time.

The data supplied by Renault, indicates that all three of their systems have an almost certain probability of meeting CAFE for the model years for which they are requesting a waiver. Vehicle 785, using the oxidation catalyst system, had higher 4K and average durability fuel economy [5 at enclosure] than vehicles using the three way and dual catalyst systems [4 at 3–5, 3–6]. Vehicle 785 is also the vehicle which was projected to pass the 0.41 HC, 3.4 CO, 1.0 NO_x standard. It is therefore, the opinion of the EPA technical staff, that fuel economy is not an issue for Renault in meeting 3.4 CO.

Peugeot

Peugeot did not claim any fuel economy penalty in going from 7.0 to 3.4 CO. Peugeot, like Renault, failed to provide sufficient data necessary to extensively evaluate the fuel economy differences at the two levels. [1 at 100]. The technical staff has no choice but to conclude that fuel economy is not an issue for Peugeot in meeting 3.4 CO.

IX. Lead Time

a. *Renault*—For 1981, Renault plans to use an oxidation catalyst system, with exhaust gas recirculation and air injection if granted a waiver on the 85 CID engine. Representatives from Renault testified at the February 12, 1980 hearing that there would not be any lead time problems associated with using their oxidation catalyst system in 1981 [1 at 44]. The only time necessary, they said, was two or three months for carburetor calibration. This system which is already developed and being used on production vehicles, is the same system as that of durability vehicle 785. EPA has projected that vehicle 785 will pass 1981 certification.

Renault has several other options available to them for the 1982 model year. One possibility could be to increase the length of their three way catalyst container in the wheel housing. Measurements indicate than an

oxidizing substrate could be added to the lengthened container in order to optomize the location of the oxidation catalyst in an effort to meet the 3.4 CO standard. Renault representatives testified that in their judgment, a heat shield is necessary for this catalyst location, based on temperature measurements in this configuration on a production California Le Car [1 at 26] [13 at I.1]. The EPA staff concludes that sufficient space is available for a heat shield in front of the lengthened catalyst, thought the temperature data supplied does not conclusively indicate a need for one.

Another alternative would be the addition of a start-up oxidation catalyst to Renault's oxidation catalyst system. At the hearing of February 12, 1980, representatives from Renault indicated that there should be enough room for light-off catalysts with their oxidation catalyst system, but that there is not enough lead time available to use them in 1981 [1 at 36]. Renault stated in their follow-up submission that under the most favorable conditions, retail sales could not begin before March 1982, and that this date is not acceptable for the introduction of a 1982 model [13 at III.2]. EPA is not convinced that the lead time necessary for the production of these oxidizing start catalysts will exclude the 1982 model year as a possible starting date.

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2. Peugeot Application For Waiver of 1981 and 1982 Carbon Monoxide Emission Standard, December 1979.

3. Letter and Enclosure to Mr. Charles Freed (Office of Mobile Source and Noise Enforcement of EPA) from Mr. Richard H. Lucki (Automobiles Peugeot) dated February 26, 1980.

4. Petition for Reconsideration of Renault's Application for Waiver of the 1981 and 1982 Carbon Monoxide Emission Standard For the Renault Le Car, January 10, 1980.

5. Letter and Enclosures to Mr. W. Pidgeon (Emission Control Technology Division of E.P.A.) from Ms. Connie Ludwig (Renault, U.S.A.), dated April 9, 1980.

6. *Renault Application for Waiver of 1981 and 1982 Carbon Monoxide Emisison Sandard,* September, 1979.

7. Leroy H. Lindgren, *Cost Estimations For Emission Control Related Component—Systems and Cost Methodology Description,* EPA Publication #460/3–78–002, March 1978.

8. **Federal Register,** Vol. 44, No. 179, September 13, 1979.

9. **Federal Register,** Vol. 44, No. 233, December 3, 1979.

10. **Federal Register,** Vol. 45, No. 22, January 31, 1980.

11. Automobile Emission Control—The Current Status and Development Trends as of March, 1976, EPA Emission Control Technology Division, Technology Assessment and Evaluation Branch, dated April 1976.

12. Letter and Enclosure to Mr. Charles Freed (Office of Mobile Source Enforcement of EPA) from Mr. Richard Lucki (Automobile Peugeot) dated March 21, 1980.

13. Letter and Enclosure to Mr. William Pidgeon (Emission Control Technology Division of EPA) from Connie M. Ludwig (Certification Program Manger, Renault U.S.A.), dated February 27, 1980.

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